

Molten-Salt Oxidation of Wastes

An attractive alternative to incineration

Molten-salt oxidation offers a clean, effective alternative to incineration for the destruction (by oxidation) of hazardous and mixed wastes, medical wastes, chemical warfare agents, and energetic materials such as explosives, propellants, and pyrotechnics. A very stable and controllable technology, it provides in situ scrubbing of acid gases and particulates.

Eliminates combustion problems

In molten-salt oxidation (MSO), combustible waste is oxidized in a bath of molten salts (at 500–950°C). The organic components of the waste react with oxygen to produce carbon dioxide, nitrogen, and water. The inorganic components, including radioactive materials, form inorganic residues that are retained in the molten salt. The salt, being alkaline, “scrubs” any acid gases, such as hydrochloric or sulfuric acid, produced in the oxidation of halogenated or sulfur-containing wastes. Continuous recycling removes residues and neutral salts from the molten salt bath.

APPLICATIONS

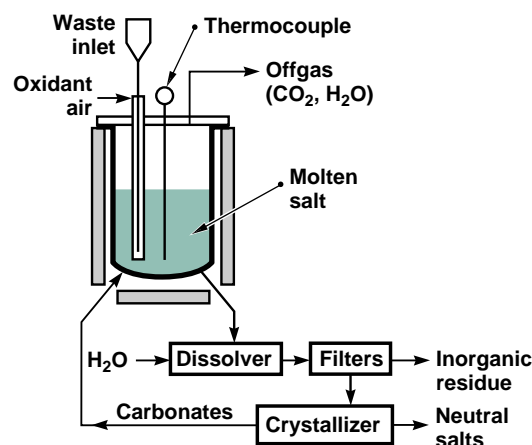
- Hazardous wastes
- Mixed wastes
- Medical wastes
- Chemical warfare agents
- Explosives, propellants, and pyrotechnics

MSO offers several advantages over incineration. Its lower operating temperatures and liquid-phase media greatly reduce the production of nitrogen oxides and fugitive emissions of radionuclides. The unique chemistry and design of the MSO process achieve negligible dioxin/furan generation.

Effective for many waste types

We have been operating MSO reactors since 1991, processing a variety of organic solvents, energetic materials (explosives and/or propellants slurried in oil–water emulsions), and chemical-warfare agent surrogates. We have investigated operation in both single- and two-stage modes, operating the first stage in either a reducing or an oxidizing atmosphere.

While we continue to demonstrate the technology on the bench scale, we are scaling up the processes for destroying both energetic



Molten-salt oxidation destroys wastes in a bath of molten salts. Organic components react with oxygen to produce carbon dioxide, nitrogen, water; inorganic components form residues that are retained in the molten salt until recycling removes them.

materials and mixed-waste surrogates. A pilot-scale reactor that will process up to 20 kilograms per hour of actual mixed waste is scheduled for demonstration in LLNL's Mixed Waste Management Facility.

Availability: We are seeking industrial partners to develop and commercialize molten-salt systems specially tailored for specific waste streams.

Contacts

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